

Draft

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Exhibit 1

City of Minneapolis

Street Lighting Policy & Program

Prepared by

Department of Public Works

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Section 1 – Purpose of the Minneapolis Street Lighting Policy

The City of Minneapolis has developed a Street Lighting Policy that will support the City's goals for livable communities and urban development. Appropriate lighting levels are a security and safety issue.

A policy will help to ensure that areas of Minneapolis receive consistent treatment and it will give clear guidance to elected officials, residents, developers, and the Department of Public Works on all aspects of street lighting system installation and maintenance.

The Street Lighting Policy objectives are:

- Maximizes the quality, sustainability, and visibility of the street lighting system
- Contributes to added comfort and safety for pedestrians, bicyclist, transit users, and motorist
- Creates a consistent and cohesive lighting system based in place-type characteristics throughout the City of Minneapolis
- Provides pole and fixture options that are aesthetically pleasing and high quality
- Provides clear guidance on expected installation methods, procedures and maintenance service levels
- Creates a system that is cost efficient, easy to operate, and maintainable
- Addresses costs to the City's capital, maintenance, and operations budgets

Three major policy areas are addressed in this document. The lighting quality standards, process for areas to upgrade their lighting system, and the funding for that upgrade.

Section 2 – History of Minneapolis Street Lighting

The City of Minneapolis Department of Public Works has been installing and upgrading street lighting for many years. The City of Minneapolis began installing fluorescent lighting systems in the business districts in 1954 and finished in 1963. Beginning in 1967 incandescent or mercury vapor fixtures became the standard for new installations. A 10-year program was approved in 1977 to replace the fluorescent fixtures with high-pressure sodium fixtures. Mercury vapor continued to be used on new installations. The high-pressure sodium "shoebox" fixture was developed in 1978 and began to replace fluorescent fixtures in 1979. Between the years of 1980 and 1983 low-pressure sodium fixtures were tested in Minneapolis and the decision was made to discontinue use. Metal Halide lighting was installed for the first time in 1983 around Riverplace. In 1984 Xcel Energy, formerly NSP, began a program to replace their mercury vapor fixtures with high-pressure sodium.

When changes in technology allowed for new light sources, the City only changed the fixtures and not the location of the pole. This left the spacing of the lights unchanged but the light levels increased. This can be seen in the Central Business District and along major corridors such as parts of Lake Street where light levels significantly exceed the recommended levels.

In 1967 the Como neighborhood residential lighting project was installed. This was the first time that low level ornamental fixtures were used in a residential area in Minneapolis. In the early 1990's other neighborhoods in the City of Minneapolis started to install low level ornamental lighting systems. Currently the neighborhoods of Stevens Square, Loring Park, Lowry Hill, Prospect Park, Field, Regina, Lowry Hill East and parts of the neighborhoods of Logan Park and Central have had low level ornamental systems installed. Other neighborhoods have expressed interest. Many neighborhood business nodes or commercial corridors have also installed low level lighting systems.

The downtown area of Minneapolis along with some of the major commercial corridors like, Lake Street, Central Ave, and West Broadway have a combination of high and low level ornamental lighting systems. Attachment 1 is a map of ornamental lighting systems in the City of Minneapolis.

Residential areas in Minneapolis, other than those previously mentioned and not shown in Attachment 1, typically have the Xcel Energy wood pole street lighting system. The Xcel Energy wood pole system is also used in alleys throughout the city.

Section 3 – Customer Service Program

Public Works has begun discussions with Xcel Energy to: define service level commitments, develop reporting requirements, and incorporate new language into the service contract between The City of Minneapolis and Xcel Energy. Public Works and Xcel Energy will review street light fixture and pole ownership options to determine what is in the best interest for the City.

Section 4 – Best Management Practices

Public Works had discussions with the City's Communications Department to improve communication with the public and other stakeholders regarding the street lighting system. The defined communication improvements will be incorporated into the street light service level commitments.

The implementation of the 311 system has assisted in tracking the response to reported outages. A private citizen will only need to know one number to report any street lighting issue and the request can be directed to the appropriate party.

A portion of the annual street lighting budget will be used each year for research on street lighting. A pilot program should be developed to develop, design, and test new fixtures and technologies. Public Works will continue to review how Minneapolis compares to other cities on:

- Street lighting levels,
- Street lighting practices and policies,
- Use of different technologies,
- Visibility Standards, and
- Balancing Dark Sky concerns with efficiency and energy usage.

Section 5 – Guidelines for Visibility (Achieving appropriate lighting levels, uniformity, and veiling luminance for various areas)

The Illuminating Engineering Society (IES) has developed industry guidelines for roadway, pedestrian way, and sidewalk lighting in regards to land uses and roadway classification. The Recommended Practices for roadway lighting systems is documented in RP-8-00 published by IES. This document includes the recommend lighting levels for different situations in the City of Minneapolis. Also included in the document is information on veiling luminance, which is related to glare.

Different areas of Minneapolis require different levels of light. Residential areas do not require as much light as commercial or high pedestrian areas. Roadway classification also has a part in the amount of lighting in an area. An example would be a major collector roadway has higher traffic volumes and

requires higher lighting levels than a local residential street. Similarly, a roadway may have a high pedestrian activity (downtown streets) and may need higher light levels.

Lighting levels and uniformity can be modified and changed by altering wattage, mounting height, and pole spacing. Two ways to increase lighting levels without changing the lamp wattage are to decrease the distance between fixtures or to increase the mounting height. Taller mounting heights help to spread the light.

Section 6 – Characteristics of Street Lighting Hardware

The Minneapolis Department of Public Works has developed performance criteria that fixtures and poles must meet to be approved for use. These requirements are in place to ensure that the lighting systems provide quality lighting, are efficient to operate and maintain plus meet safety and structural parameters. All fixtures and poles for use in Minneapolis public right-of-way must meet the performance criteria set by the Minneapolis Department of Public Works. Accommodating a limited number of approved fixtures and poles allows for reasonable inventory costs, shortens procurement time, minimizes cost, and improves the city's responsiveness. The Performance and Maintenance Criteria for Ornamental Lighting Systems is shown in Attachment 2. Likewise, the other components of the lighting system (conduits, foundations, cabinets, source of power, etc.) must be approved by the Department of Public Works.

Lighting fixtures are currently classified based on the level of cutoff. See Attachment 3 for term definitions and levels of cutoff diagrams. These classifications may be changing in the near future. Most of the ornamental light fixtures in use in Minneapolis are semi-cut off.

City street lighting fixtures, service points, and components must be in the public right-of-way and not cross private property. The power connections are underground wiring in conduit for the ornamental system and aboveground wire for the Xcel Energy system.

Solar power for street lighting is a technology that is advancing, but at this point more testing is needed. One hurdle facing solar power is the size and location of solar panels in relation to tree cover and the amount of sunlight that is received. There are other advancing light source technologies on the horizon that may be used in the future, such as Metal Halide with longer lamp life, Light Emitting Diodes (LED's) and QL (Quality Lighting). The status of these technologies is being monitored for when they may be reliable and beneficial enough to be implemented.

Technology used to track energy usage and report when lights are not functioning properly is also very close to being available. This type of technology, potentially wireless, would assist in maintenance for street lighting systems to be proactive instead of responsive.

Section 7 – Approved Fixtures and Poles

Fixtures and poles approved for use on the right-of-way will be eligible for at other locations within the City of Minneapolis. Currently, the City of Minneapolis has two styles of low-level post-top fixtures approved for use, the lantern and the acorn, and one high-level style, the shoebox. The number of approved fixture and pole styles will be focused to allow for reasonable inventory, improve response time, minimize costs, and shorten procurement time. The City of Minneapolis Department of Public Works is seeking to add up to two more low and mid-level post-top fixtures to the approved list.

The City of Minneapolis has one approved pole style for low level lighting installations, one style for mid-level, and one for high level. The City of Minneapolis Department of Public Works is seeking to add

one additional low and mid-level pole to the approved list. Dark paint colors should be used for poles to resist graffiti and fading due to weather and sunlight. See Attachment 4 for the current and proposed approved lighting fixtures and poles.

Section 8 – Lighting Districts and Funding of Lighting Systems

Districts:

The City of Minneapolis will have three distinct districts: Residential Areas, Pedestrian Areas, and the Central Business District (CBD) Centroid. These districts have different lighting level requirements. For further detail on the CBD-Centroid and Pedestrian Districts, See Section 11 – Central Business District-Centroid or Pedestrian Area Ornamental Lighting Systems, for information regarding the lighting level requirements, definition of the areas, and map. The districts for lighting are based on and compatible with the Minneapolis Plan and the Access Minneapolis – 10 Year Transportation Action Plan.

Capital Costs:

A long term program to install street lighting in a systematic manner across the city of Minneapolis will result in a Street Light Fee. The cost for street lighting installation will be spread city-wide, the adjacent properties may pay a larger portion of the cost. This is similar to the way roadwork is funded. Previously, the capital costs of ornamental street lighting systems have been paid through special assessments to the adjacent benefiting property owners and a street lighting district was established at that time.

Capital costs for the Xcel Energy wood pole system is amortized and has been paid from the City of Minneapolis general fund with revenue from property taxes.

Operation and Maintenance Costs:

A city wide street light fee would fund all of the operations (electricity) with maintenance of street lighting in Minneapolis to remain in the General Fund. This fee would be charged to each residential dwelling unit and non residential properties in the City of Minneapolis.

Street lighting operation and maintenance costs in the past have been paid from the City of Minneapolis' general fund when the systems do not exceed the current standard lighting levels and associated operation and maintenance costs. When light levels exceed the city recommended level, the adjacent benefiting property owners have been assessed an annual operation and maintenance charge for the extra amount over the standard lighting cost.

There is a maximum light level that will be allowed by the city, regardless of a property owner's or developer's willingness to pay the operation and maintenance charge. This maximum light level varies based on the use of the area (residential, CBD-Centroid, or pedestrian activity areas).

The differences in cost from our existing or standard lighting levels and the cost for Central Business Districts (CBD) or Pedestrian Districts areas are shown in Attachment 5.

Special Features and Services:

Currently, a Special Service District must be created to fund the maintenance of special features such as banners, electricity for outlets mounted on light poles, and twinkle lights. Amenities beyond the basic streetlight and pole will continued to be allowed through a Special Service District.

Section 9 – Standard Street and Alley Lighting (Xcel Energy Wood pole system)

This lighting system is referred to as "non-ornamental" or "wood pole" lighting and is used predominantly in residential areas. Approximately 85% of the City of Minneapolis is lit by the Xcel Energy wood pole system.

System Standards:

Generally speaking the existing system includes one light at each intersection, one light near the midpoint of short blocks (approximately 300-foot blocks - usually east/west) and two lights on long blocks (approximately 600-foot blocks - usually north/south) at the one-third points. On blocks longer than 600 feet, lights are spaced approximately 200 feet apart. Standard alley lighting follows the same spacing as street lighting, with lights spaced approximately 200 feet apart. The intersection lights are 150-watt high-pressure sodium (HPS) fixtures and the mid-block lights are 100-watt HPS fixtures. The lighting fixture style currently used by Xcel Energy throughout the City is the Cobrahead style light. The fixture is mounted on a wood pole with power fed through overhead lines.

The existing spacing layouts for street and alley lighting are shown in Attachment 6 – Standard Street Lighting and Attachment 7 – Standard Alley Lighting.

Based on this Street Lighting Policy, the wood pole system no longer meets the City's visibility standards. Therefore, the existing wood pole system on streets will be replaced and the wood pole lights in alley will be retained.

Costs:

This lighting system is installed, operated, and maintained by Xcel Energy. Xcel Energy charges a flat monthly rate to the city for electric usage, any maintenance that is required, and the amortized capital costs. The costs for the Xcel system will be covered by the General Fund and street lighting fees.

Process to Obtain Alley Lighting:

- 1) Property owners, or residents, can request these lights on their alley by submitting in writing a request to the Department of Public Works. The request must include the alleys on which the requested lighting would be located as well as the number of lights being requested, contact name and phone number.
- 2) The Department of Public Works will determine the maximum allowed number of lights and visit the block, and if a light is needed will then notify the affected Ward office and properties along the alley to provide them time to comment.
- 3) After giving the Ward office and property owners 10 working days to comment on the alley light installation, a "To The Record" letter is sent to the respective Ward office for their approval. The signed "To The Record" is then submitted quarterly in receive and file format to the City Council for final documentation.
- 4) Once the request has proper approvals, The Department of Public Works will direct Xcel Energy to install the respective lighting. Xcel Energy and the Department of Public Works will concur on the final location. Xcel Energy is responsible for the planning, installation, operation and maintenance of these lights.

Light Removal:

Under unique circumstances, the wood pole street/alley lights may need to be removed. A five-year minimum installation period is required by the Xcel Energy contract with the City of Minneapolis. There may be costs charged to property owners if the removal of a light occurs prior to the completion of this minimum installation period.

For removal of existing standard lights, the request must secure a petition signed affirmatively by property owners or residents representing 100% of the affected front footage of the block(s) abutting the street or alley on which the street light is to be removed. Public Works will create and conduct this petition process.

Additional Lights in Excess of the City Standards:

There are no provisions for additional city paid lighting in excess of the City's lighting standards. Property owners may contact Xcel Energy directly to discuss details and costs of additional lighting for their private property. The City is not involved in these light installations or costs.

Section 10 – Residential Ornamental Low- or Mid-level Lighting

Existing low-level ornamental lighting has a mounting height of 12 or 15 feet and is most commonly found in residential areas.

This ornamental low-level lighting system (previously referred to as "pedestrian level" lighting) is used in residential areas as a replacement for and improvement to the wood pole street lighting (See Section 7) provided by the City through Xcel Energy. This ornamental low-level system typically results in an increased number of lighting units in a block and a more even distribution of light. The light fixture is lower in height and often considered more pleasing in appearance than the wood pole street/alley lighting system. These lights are also designed to better illuminate sidewalks as well as roadways. The operation and maintenance costs are similar to the wood pole street/alley light. See Attachment 5 for the cost comparisons.

The process for installing ornamental street lighting is priority driven. Priorities that will be considered (in no particular order) are:

- Part of street reconstruction projects
- Areas without any lighting
- Areas with lighting not meeting City standards
- Areas with deteriorated lighting systems
- Pedestrian Crashes
- Bicycle Crashes
- Bicycle Corridors
- People Density (Population and Employment Density)
- Safety/Security/Crime
- Activity Centers
- Traffic Volumes
- Geographic balance

Lighting can be installed as a stand-alone project or in conjunction with a street renovation or reconstruction project. Lighting will be installed as part of road construction projects to reduce costs and construction disruption.

System Standards:

Currently, there are two approved fixture styles - the acorn and the lantern. Up to two additional fixture styles may be approved if they meet the criteria set by the Department of Public Works. Fixtures are mounted on an approved pole at a height of 15 feet. This height was chosen to optimize light distribution on the street and sidewalk while minimizing the opportunity for vandalism while maintaining a pedestrian scale.

The lighting system is powered by underground wiring. Generally all overhead light fixtures mounted on wood poles along the streets will be removed in the project area. Wood poles and overhead wiring will be removed wherever possible, if they are not supporting other utilities.

The style of fixture to be installed will be discussed with the developer, neighborhood, or business group. The Department of Public Works encourages continuity of fixture style in sections of the City to maintain uniformity in style and avoid an inconsistent block-to-block style change. The proposed area must consist of at least four contiguous blocks.

The design standards for this lighting system are shown in Attachment 9 – Ornamental Low-Level Residential Street Lighting. The lighting project must meet the Average Foot-candles, Uniformity Ratio and Veiling Luminance Ratio defined by this policy. Pole spacing and quantity may vary depending on the street width and topography. The Department of Public Works shall review and approve all lighting fixtures, poles, project design and construction.

Costs:

Public Works will develop a 30 year residential street lighting implementation plan based on the policy prioritization criteria and funded by a street light fee for the capital installation of new street lighting systems. In addition, residential areas would receive updated lighting when the adjacent street is being reconstructed.

All costs to administer, design and construct a residential lighting system are considered capital costs. The requesting individual, developer, organization, district, or property owners are responsible for all capital costs for the proposed lighting system and will be billed accordingly.

Private Developments:

New residential or business developments may request to install ornamental lighting as part of their new project and the implementation costs will be billed accordingly. New street lights are encouraged to be installed for at least one block and not on a property-by-property basis. However, if a new development proposes to install street lighting on just along their property frontage, the property owner at their own cost must complete and submit to the Department of Public Works for their approval the following items:

- 1) A lighting plan for the entire block (both sides) that indicates where all street lights would be installed that is consistent with the standard lighting fixture and pole style for the general area,
- 2) Define which lights will be installed by the development,
- 3) Define which lights will be removed, (If no lights are to be removed or the installation results in lighting levels or operation and maintenance charges greater than defined for the area, the property owner will be responsible for the additional operation and maintenance charges.)
- 4) Prepare an engineered lighting plan that indicates the average foot-candles and uniformity ratio standards are still met with the respective changes.
- 5) Following the installation the property owner or developer must provide the Department of Public Works with a set of as-built plans, or hire the traffic division to perform construction inspection and as-builts.

The Department of Public Works must approve the material components, and locations of all installations of lighting systems on public right-of-way.

Private lighting systems (systems that use fixtures and poles that are not adopted for use by the City of Minneapolis) may be installed on the public right-of-way in addition to city street lights. Private lighting systems are not to be considered to be substitutes for city standard street lighting. The private systems must be installed by encroachment permit and be reviewed and approved by the Department of Public Works for safety, photometric, structural requirements, and ability to accommodate in the right-of-way given the limited space. Fixtures will be reviewed based on safety, the amount of light provided, the potential for glare, and the stability of the structures.

End of Useful Life:

An ornamental lighting system has a useful life of approximately 30 years. The City Engineer will determine the end of the lighting system's useful life.

Section 11 – Central Business or Pedestrian District Ornamental Lighting Systems

There are two basic classifications - the Central Business District- Centroid and Pedestrian Districts (See Attachment 11 – Definition of Districts). The Central Business District has a more intense light level than the Pedestrian District. The process for installation, financing, and removal is essentially the same for both classifications and will apply to new developments, commercial blocks, intersections or other areas. In general, this lighting system will accommodate the special increased lighting needs for commercial and high pedestrian activity areas.

System Standards:

Central Business and Pedestrian Districts have more intense lighting level requirements than residential areas. The lighting hardware is mounted on higher poles and/or spaced closer together to produce increased light levels. The street lighting design shall be in accordance with City's lighting standards utilizing City approved poles and fixtures. Low, Mid, and High-level ornamental lighting has varying mounting heights and is generally found in the central business district, node business districts, along major roadways, and in high pedestrian activity areas.

The process for installing ornamental street lighting is priority driven. Priorities that will be considered (in no particular order) are:

- Part of street reconstruction projects
- Areas without any lighting
- Areas with lighting not meeting City standards
- Areas with deteriorated lighting systems
- Pedestrian Crashes
- Bicycle Crashes
- Bicycle Corridors
- People Density (Population and Employment Density)
- Safety/Security/Crime
- Activity Centers
- Traffic Volumes
- Geographic balance

Lighting can be installed as a stand-alone project or in conjunction with a street renovation or reconstruction project. Lighting will be installed as part of road construction projects to reduce costs and construction disruption.

Central Business District (CBD)- Centroid

The CBD-Centroid lighting must meet the Average Foot-candles, Uniformity Ratio, and Veiling Luminance Ratio developed in this policy. The light pole spacing standards reflect a typical 60-foot wide commercial street. Pole spacing may vary depending on the street width to provide the approved light levels. The Department of Public Works must review and approve all lighting fixtures and pole placement. The standards for the high, mid and low-level CBD lighting systems are as follows:

Pedestrian District (PD)

The PD lighting must meet the Average Foot-candles, Uniformity Ratio, and Veiling Luminance Ratio developed in this policy. The light pole spacing standards reflect a typical street width. Pole spacing may vary depending on the street width to provide the necessary light levels. The Department of Public Works must review and approve all lighting fixtures and pole placement. The standards for the high, mid and low-level PD lighting systems are as follows:

Development Driven Lighting Requests

New street lights are recommended to be installed on an entire CBD/PD block and not on a property by property basis. However, if a CBD/PD property proposes to install street lighting on just their property, the property owner at their own cost must complete and submit to the Department of Public Works for its approval the following items:

- 1) A lighting plan for the entire CBD/PD block (both sides) that indicates where all street lights would be installed that is consistent with the lighting fixture and pole style for the general area,
- 2) Define which lights will be installed by the property,
- 3) Define which lights will be removed. (If no lights are to be removed or the installation results in lighting levels or operation and maintenance charges greater than defined for the area, the property owner will be responsible for the additional operation and maintenance charges.)
- 4) Prepare an engineered lighting plan that indicates that the policy criteria are achieved with the proposed changes.
- 5) Following construction the property must provide the Department of Public Works with a set of as-built plans, or hire the traffic division to perform construction inspection and as-builts.

The Department of Public Works must approve the material components, and locations of all installations of lighting systems on public right-of-way.

Private lighting systems (systems that use fixtures and poles that are not adopted for use by the City of Minneapolis) may be installed on the public right-of-way in addition to city street lighting. Private lighting systems are not to be considered to be substitutes for city standard street lighting. The private systems must be installed by encroachment permit and be reviewed and approved by the Department of Public Works for safety, photometric, structural requirements, and ability to accommodate in the right-of-way given the limited space. Fixtures will be reviewed based on safety, the amount of light provided, the potential for glare, and the stability of the structures.

Costs:

Public Works will develop a 20 year CBD/PD street lighting implementation plan based on the policy prioritization criteria and funded by a street light fee for the capital installation of new street lighting systems. In addition, these areas would receive updated lighting when the adjacent street is being reconstructed.

All costs to administer, design and construct a CBD or PD lighting system are considered capital costs. The requesting individual, developer, organization, district, or property owners are responsible for all capital costs for the proposed lighting system and will be billed accordingly.

End of Useful Life:

The CBD/PD lighting systems have a useful life of approximately 25 years. The City Engineer will determine the end of the lighting system's useful life.

Section 12 – Park Board Lighting

The City of Minneapolis Department of Public Works operates and maintains the existing lighting systems along Minneapolis parkways. The parkway system has become costly to operate, repair and maintain since most of the existing system is past the useful life and many sections are failing.

Minneapolis Department of Public Works has worked with the Minneapolis Park Board to select a new fixture and pole for the parkway lighting system so that it is more reliable, uses newer technology, and is cost efficient to operate and maintain.

System Standards

The original lighting system was installed using direct buried wire, the new system will be installed by having the wire in an underground conduit system.

The new standard selected by the Park Board and the City of Minneapolis, will be a metal halide tear-drop fixture, mounted on an 18 foot pole. There will be a decorative skirt on the fixture. The lights at the intersections will be 150 watts, while the mid-block light will be 100 watts. Light locations for the new system will approximately remain in the same position as the old lighting system.

Cost

The cost to install the new system will be funded primarily by programming dollars in the City's Capital Improvement Plan budget, and by any additional grants the City and/or Park Board may receive. This project will take a number of years to complete and begin in areas that are most in need of replacement.

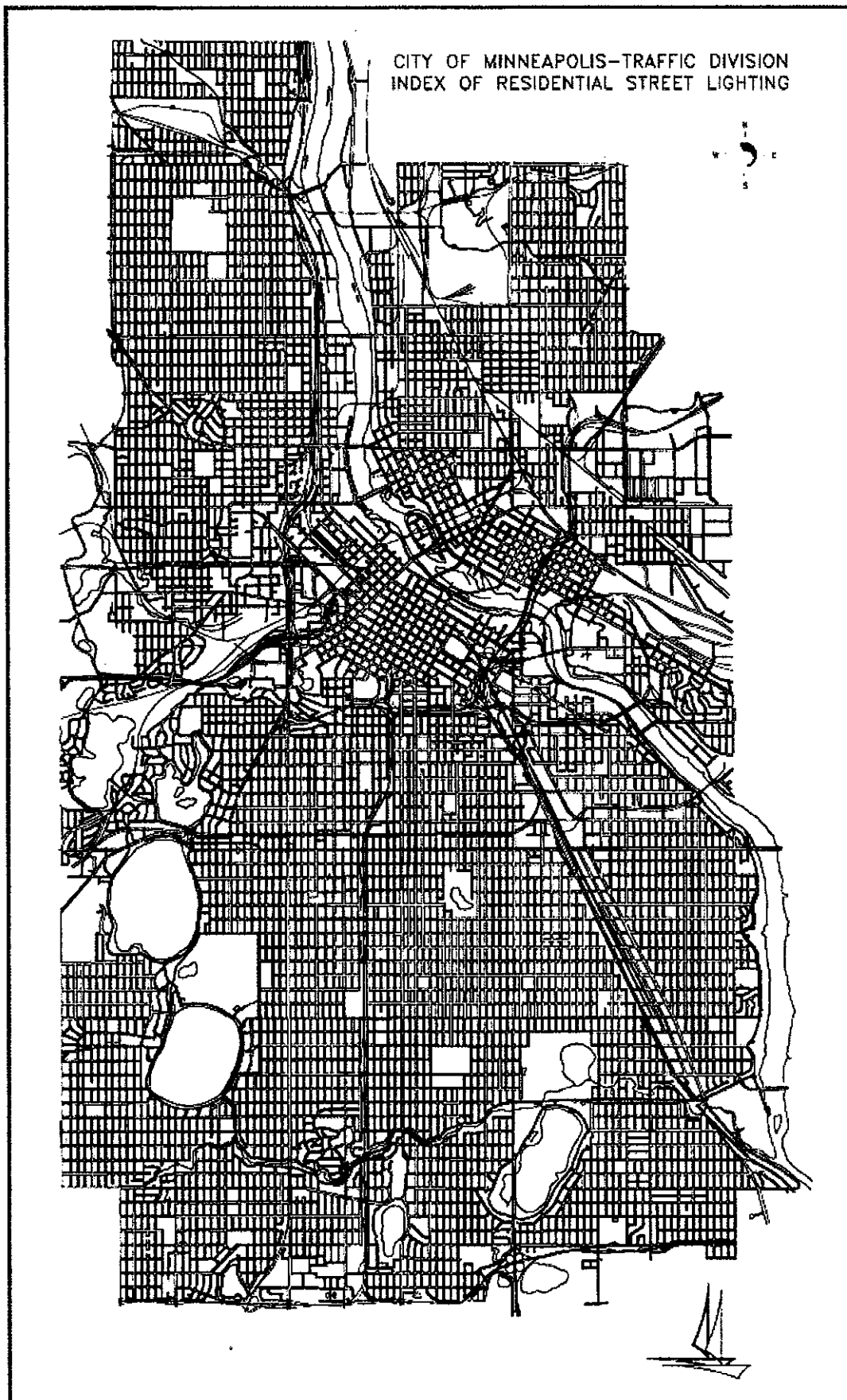
The fixture selected for the parkway is more costly and labor intensive to install than the light fixture used on typical Minneapolis streets. There is an agreement for the Park Board to reimburse Public Works for these additional costs.

Process for installation

The new parkway light system will be installed over a number of years and has started in areas where the existing system was in the worst condition. The new lighting installation is being prioritized based on the failure rate of the existing system.

Useful Life

The parkway lighting systems have a useful life of approximately 25 years. The City Engineer will determine the end of the lighting system's useful life.



Performance and Maintenance Criteria for Ornamental Lighting Systems

Criteria for Low and Mid- Level Systems

Fixture Performance

- Must be UL listed
- HPS 100 watts
- Published manufacturers 5-year warranty on all electrical components
- Coefficient of Utilization (CU)
- Efficiency

Fixture Maintenance

- Tool-less access to electrical components
- Multi-tap ballast
- Mogul base
- Maintenance able to be done by one-person
- Maximum weight 50 lbs.
- Accept 3 inch tenon
- Acrylic lens

Pole Criteria

- Aluminum, steel, or stainless steel
 - 12 foot poles in Residential Areas, 20 foot poles in the Central Business District
 - Pole and Base must be one Piece
 - Manufacturers warranty
 - Must meet AASHTO Design standard for wind load
 - Minimum conduit entrance – 10inch diameter (able to accept 3 2inch schedule 40 PVC conduits)
 - Maximum exterior base diameter of 22 inches, maximum foundation 24inches
 - Able to accept a recessed duplex outlet at a height of 11 feet
 - 3 inch diameter tenon 2.6 to 3inches long
- access door with a removable cover at least 6 inches high and a minimum of 30 square inches

Criteria for High Level Systems

Fixture Performance

- Must be UL listed
- HPS 250 watts
- Published manufacturers 5-year warranty on all electrical components
- Coefficient of Utilization

Fixture Maintenance


- “Shoebox” style
- Acrylic lens
- Maintenance able to be done by one-person
- Maximum weight 50 pounds

Pole Criteria

- Pole must be compatible with city standard foundation and transformer base
- Aluminum, steel, or stainless steel
- Must meet AASHTO Design standard for wind load
- 30 foot (40 foot may be used on some Trunk Highway routes)

Term Definitions and Diagrams of Cutoff Classifications

The limited list of lighting related terms below are provided in order to make all decision makers and the public aware of nationally accepted standard terms and their definitions used in the lighting industry. Light poles and lighting systems actually have many distinct parts that work together to make a single light source installation. Similarly, there are various ways of measuring lighting levels and power, as well as many different styles of lighting fixtures.

TERM	ABBREV.	DESCRIPTION
Alternating current	AC	The flow of electricity which travels in waves and pulses on and off in cycles many times per second. The most common frequency of electricity used in this country is 60 cycles per second (hertz).
Acorn		 A traditional looking lens for a luminaire.
Acrylic		A damage resistance material often used for lighting housings such as acorns and globes.
Ambient light		General uniform illumination throughout the (work) area.
Base		Lowest portion of the pole assembly that connects the main pole to its mounting facility, or houses that connection, such as a concrete footing. May have an access panel.
Ballast		Device used in fluorescent and HID luminaires to provide the necessary starting voltage and to limit the lamp current during operation.
Banner arm		Accessory for attachment of decorative and event banners.
Beam Angle		Angular dimension of the cone of light from reflectorized lamps.
Cap		Decorative metal covering over the outside top of a luminaire such as an acorn.
Cobrahead		A type of standard street fixture with the luminaire extended out from the pole over the street on a long metal neck structure.
Color rendering index	CRI	Measure of the degree of color shift that an object undergoes when illuminated by a light source as compared with the color of the same object when illuminated by a referenced source of comparable color temperature. CRI is expressed as a number where 100 indicates that there is no color shift.
Conductor		A substance or material (typically wire) capable of carrying electric current.
Conduit		A protective tube that carries cables and wires to protect them from the elements.
Crossarm		The extension from the light pole that the head/luminaire is attached to.
Current		The flow of electrons in an electrical circuit (measured in amperes)
Cut-off angle		The angle from the photometric vertical axis at which a reflector, louver, or other shielding device cuts off direct visibility of a lamp. It is the complementary angle of the shielding angle.
Dark sky		A movement to reduce nighttime light pollution into the sky.

Diffuser		A translucent piece of glass or plastic that shields the light source in a fixture. The light distribution through the diffuse piece of glass or plastic will be even or "soft."
Direct bury		Method of pole placement where the lower end of the pole is buried into the existing soil.
Efficiency		The ratio of the lumen output of the luminaire to that of the bare lamp.
Finial		A decorative point typically affixed to the cap of a luminaire or the post.
Flag pole holder		Accessory near top of pole for holding flags.
Fluted pole		Traditional pole, possibly tapered, with parallel, linear, half-circle indents running the length of the pole and with possibly a matching base.
Fluorescent		A linear light source consisting of a tube filled with gas. When electrical current is applied, the resulting arc emits ultraviolet light that excites the phosphors on the inside of the lamp wall, causing them to radiate visible light.
Footcandle (FC)	FC	The English unit of measurement of the illuminance onto a surface. One footcandle is equal to one lumen per square foot. Also, the amount of light from a candle that falls on 1 square foot of surface. 1 FC = 10.76 lux.
Glare		The effect of brightness or brightness differences within the visual field sufficiently high to cause annoyance, discomfort or loss of visual performance. Alt. The sensation produced by luminance within the visual field that is significantly greater than the luminance to which the eyes are adapted.
Ground wire		A wire that makes a connection between a piece of electrical equipment and the ground, so the user is protected from electric shock if the equipment develops a fault.
Halogen lamp		Gas used in tungsten-halogen lamps which increases lamp life and enhances lumen output.
Head		Generally, the part of the luminaire that holds the lamp socket and mounting hanger or collar. When the mounting collar is part of or attached directly to the reflector housing, as in a clamshell style, that assembly has been referred to as either the head or the body.
High Intensity Discharge	HID	Abbreviation for High Intensity Discharge. Generic term used to describe mercury vapor, metal halide, high pressure sodium light sources and fixtures.
High Pressure Sodium	HPS	High intensity discharge (H.I.D.) lamp in which light is produced by radiation from sodium vapor operating at a partial pressure of about $1.33 \times 10,000$ Pa (100 Torr). Gives a yellowish color to the lamp and surroundings.
Illuminating Engineering Society of North American	IESNA	A society of engineers specializing in lighting related design and issues (www.iesna.org).

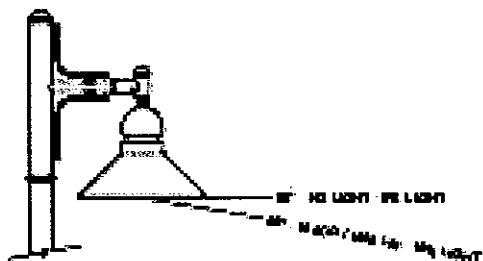
Illuminance (footcandle or lux).		Photometric term which quantifies light striking a surface or plane at a point. It is expressed either in lumens per square foot, footcandles (the English metric) or lumens per square meter, lux (the metric unit). 1 footcandle = 10.76 lux.
Incandescent lamp		Light source which generates light using a thin filament wire (usually tungsten) heated to white heat by an electric current passing through it.
Insulator		A substance or material (such as rubber or glass) that will not permit the flow of electric current.
Kilowatt hour	KwH	The measure of electrical energy usage from which electricity billing is determined.
Lamp	LP	The actual source of light in a fixture. Some people refer to fluorescent lamps as "tubes" and incandescent lamps as "light bulbs."
Lantern		A traditional style light fixture or luminaire.
Lens		Outside surface of the luminaire, consisting of textured or smooth material such as acrylic, glass, polycarbonate.
Light		The visible portion of the electromagnetic spectrum; this extends from approximately 380 to 770 nanometers (nm).
Light Loss Factor	LLF	A factor used in calculating illuminance after a given period of time and under given conditions. It takes into account temperature and voltage variations, dirt accumulation on luminaire and room surfaces, lamp depreciation, maintenance procedures and atmosphere conditions. Formerly called maintenance factor. Generally light loss factors are divided into two groups, classed as "recoverable" (with cleaning and relamping) and "nonrecoverable."
Light pollution		Upward spillage of light into the night sky, adversely affecting telescopes and satellites.
Light trespass		A situation which occurs when light from a source is distributed onto areas where the illumination is not wanted.
Low Pressure Sodium	LPS	A discharge lamp in which light is produced by radiation from sodium vapor. Considered a monochromatic light source (appears to be orange in color and renders most other colors as gray or brown).
Lumen	lm	Measurement of the light output of a lamp, or the SI unit of luminous flux.
Luminaire		A complete lighting unit consisting of a lamp or lamps, the parts designed to distribute the light (housing), and any necessary starting components (ballast, socket, etc.).
Luminaire mounting		The method of attaching the light source to the pole, either pole top or suspended on a crossarm.
Metal Halide	MH	A type of high intensity discharge (HID) lamp in which the major portion of the light is produced by radiation of metal halides, argon and mercury vapors in the arc tube. Includes clear and phosphor-coated lamps which differ in their color-rendering

		characteristics.
Mercury Lamp		A type of high intensity discharge (HID) lamp in which the major portion of the light is produced by radiation from mercury. This lamp emits light in the blue/ green range and is favored by landscape architects.
Mounting height		In a given application, the distance from the luminous area of the luminaire (typically the bottom) to the floor.
Nadir		An expression used when discussing luminaire photometry. It describes the direction the light is traveling from the luminaire to directly below the luminaire (0 angle).
National Electrical Code	NEC	Nationally recognized standards governing the installation of electrical equipment. The document compiled by the NFPA that provides safety standards for installation and application of electrical equipment.
National Electrical Manufacturers Association	NEMA	An acronym for the National Electrical Manufacturers Association. NEMA is a U.S. electrical industry organization comprised of manufacturers.
Photometry		Photometry is the science of measuring visible light in units that are weighted according to the sensitivity of the human eye.
Photometrics		Photometric Data includes measured product performance for lighting products, including luminous intensity, efficiency, and zonal luminous flux. Test reports are available from laboratories and electronic files are available from most lighting manufacturers.
Pole		The main 'stem' of a light assembly.
Receptacle		Pole accessory, a standard plug in power source with weatherproof door.
Reflector		The part of a light fixture that shrouds the lamps and directs the light emitted from the lamp.
Refractor		A device used to redirect the light output from a source, primarily by bending the waves of light.
Shoebox		An outdoor luminaire that emits most useful light at lower angles. Essentially, no light above 90 degrees is displayed. Sometimes called a "shoebox" because of its rectangular shape.
Solar lighting		Lighting using the sun's energy as the direct power source, and typically comprised of the light, pole, solar collector, insulated battery, support hardware, charging and lighting controller, wire, and related materials, all of which are often at the top of the pole.
Surface mount		Method of bolting the pole base to a concrete surface or footing.
Transformer	Xfmr	A device designed to transfer energy from one circuit to another by electromagnetic induction. Transformers are typically used to increase (step up) or decrease (step down) the voltage from one circuit to another. The turns ratio, or number of windings on

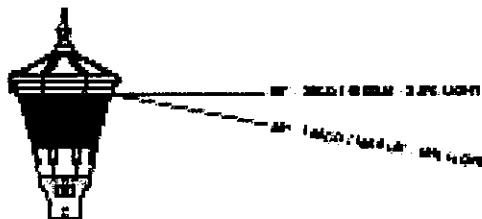
		the primary and secondary sides of the transformer, will affect the change in voltage.
Underwriter's Laboratories	UL	Private organization which tests and lists electrical (and other) equipment for electrical and fire safety according to UL and other standards. Not an indication of overall performance.
Visible spectrum		Visible light
Watt	W	The unit for measuring electrical power. It defines the energy consumed by an electrical device when it is in operation.
Wire		Copper strands that actually carry power to the lamps.
Zenith		The point of direction directly above the luminaire (180 degree angle).

Lighting term sources:

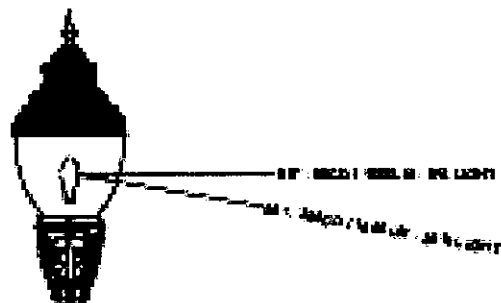
- City of Minneapolis
- GE
- Hubbell
- Lithonia
- manufacturer catalogs



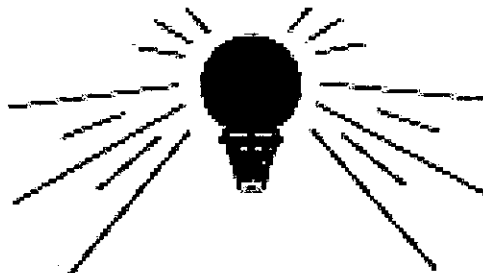
Full Cutoff — A luminaire light distribution with zero candela (intensity) at an angle of 90 degrees or above. Additionally, the candela per 1000 lamp lumens does not exceed 100 (10%) at a vertical angle of 90 degrees.



Cutoff — A luminaire light distribution where the candela per 1000 lumens does not exceed 25 (2.5%) at an angle of 90 degrees or any angle above. Additionally, the candela per 1000 lamp lumens does not exceed 100 (10%) at a vertical angle of 90 degrees.



Semi-Cutoff — A luminaire light distribution where the candela per 1000 lumens does not exceed 50 (5%) at an angle of 90 degrees or any angle above. Additionally, the candela per 1000 lamp lumens does not exceed 200 (20%) at a vertical angle of 90 degrees.



Non-Cutoff — A luminaire light distribution where there is no candela restriction at any angle.

Lighting Unit Choices

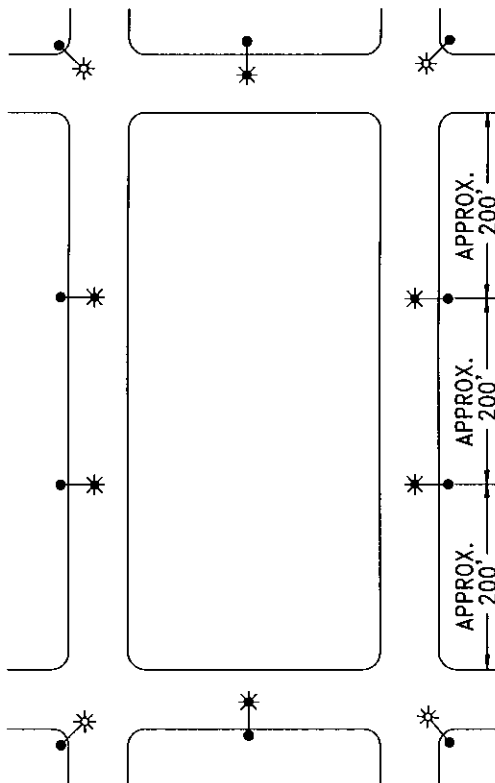
(See attachment 10)

Cost of lighting systems
(see attachment 10)

City of Minneapolis
Standard
Street Lighting

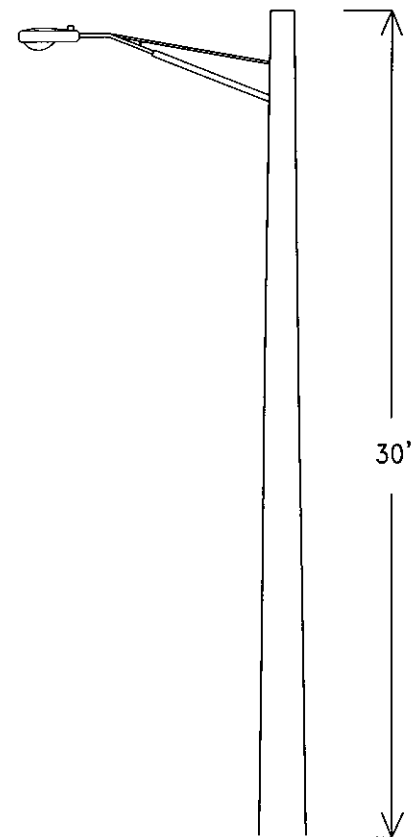
ATTACHMENT 6

TYPICAL
BLOCK



- ☼ 150w HPS Fixtures (Typical) at intersection
 - ★ 100w HPS Fixtures (Typical) mid block
- Note: Spacing will vary based on field conditions

WOOD
POLE &
FIXTURE



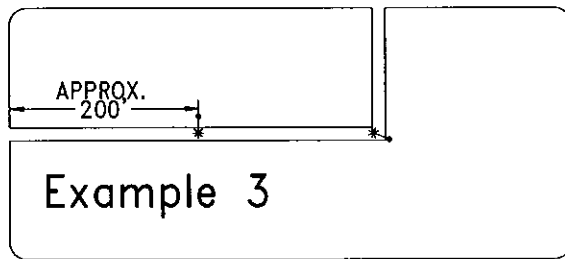
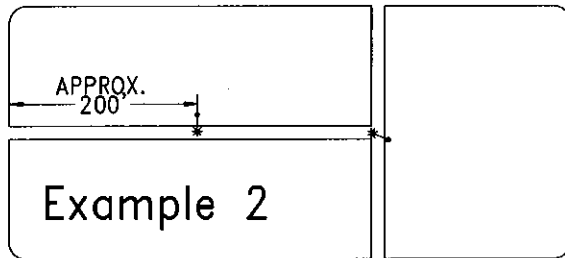
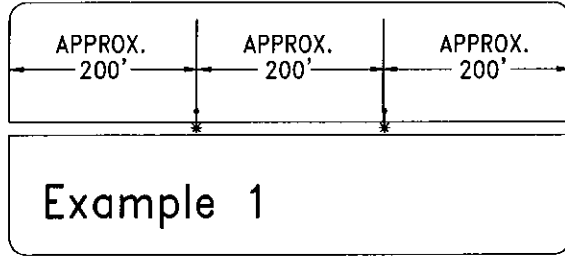
NO SCALE

December 2004

City of Minneapolis
Standard
Alley Lighting

ATTACHMENT 7

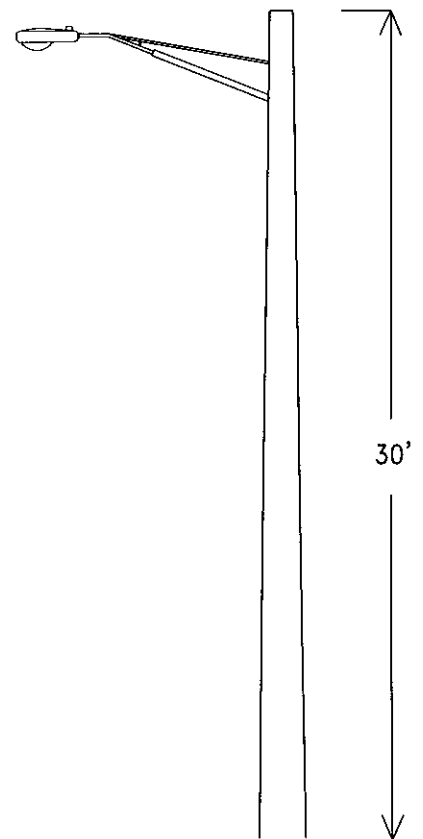
TYPICAL
BLOCK



100w HPS Fixtures (Typical)

Note: Spacing will vary based on field conditions

WOOD
POLE &
FIXTURE



NO SCALE

December 2004



DEPARTMENTAL USE ONLY

Date Received _____
 Date Approved _____
 Type Light _____
 Project No. _____
 Petition % _____
 Ward _____

**PETITION REQUESTING STANDARD (WOOD POLE) RESIDENTIAL AREA
STREET/ALLEY LIGHTING**

We, the following property owners/residents upon _____ between the limits of _____ and _____, by affixing our signatures below, do hereby petition the City Council to authorize the installation of _____ standard wood pole street/alley light(s) in this area.

The light(s) would be located approximately _____.

65% of the properties listed on the petition must approve of the installation.

Public Works must receive the completed petition by _____ to be considered.

Property owner/resident Name	Property owner/resident Signature	Property Address
		XXXX Street
		XXXX Street
		XXXX Street
		XXXX Street
		XXXX Street
		XXXX Street

For additional information, contact the Traffic Engineering Division, 350 S 5th St, Rm 233 City Hall, Minneapolis, MN 55415 or call (612) 673-2411.

System Planning Approach

Overview

- Based on the Access Minneapolis -- Transportation Action Plan efforts
- 3 areas that have different land uses and therefore need different lighting levels
 - CBD Centroid Area
 - Pedestrian Areas
 - Residential Areas
- Attached is a description of the 3 areas and an initial map that begins to illustrate the 3 areas. Public Works will seek community input on the map regarding CBD Centroid and Pedestrian Lighting Areas.

Definition of Lighting Areas

Central Business District (CBD) Centroid Lighting Area

The area within the following boundaries defines the CBD Centroid:

- Mississippi River to the north
- Chicago Ave to the east
- 14th Street E and 12th Street S to the south
- I-394 Third Ave Distributor and the BNSF railroad tracks to the west

The area outside the CBD Centroid but within the river and freeway ring will be considered a Pedestrian Lighting Area.

Pedestrian Lighting Area

Pedestrian Lighting Areas will be defined based on the meeting most of the following criteria:

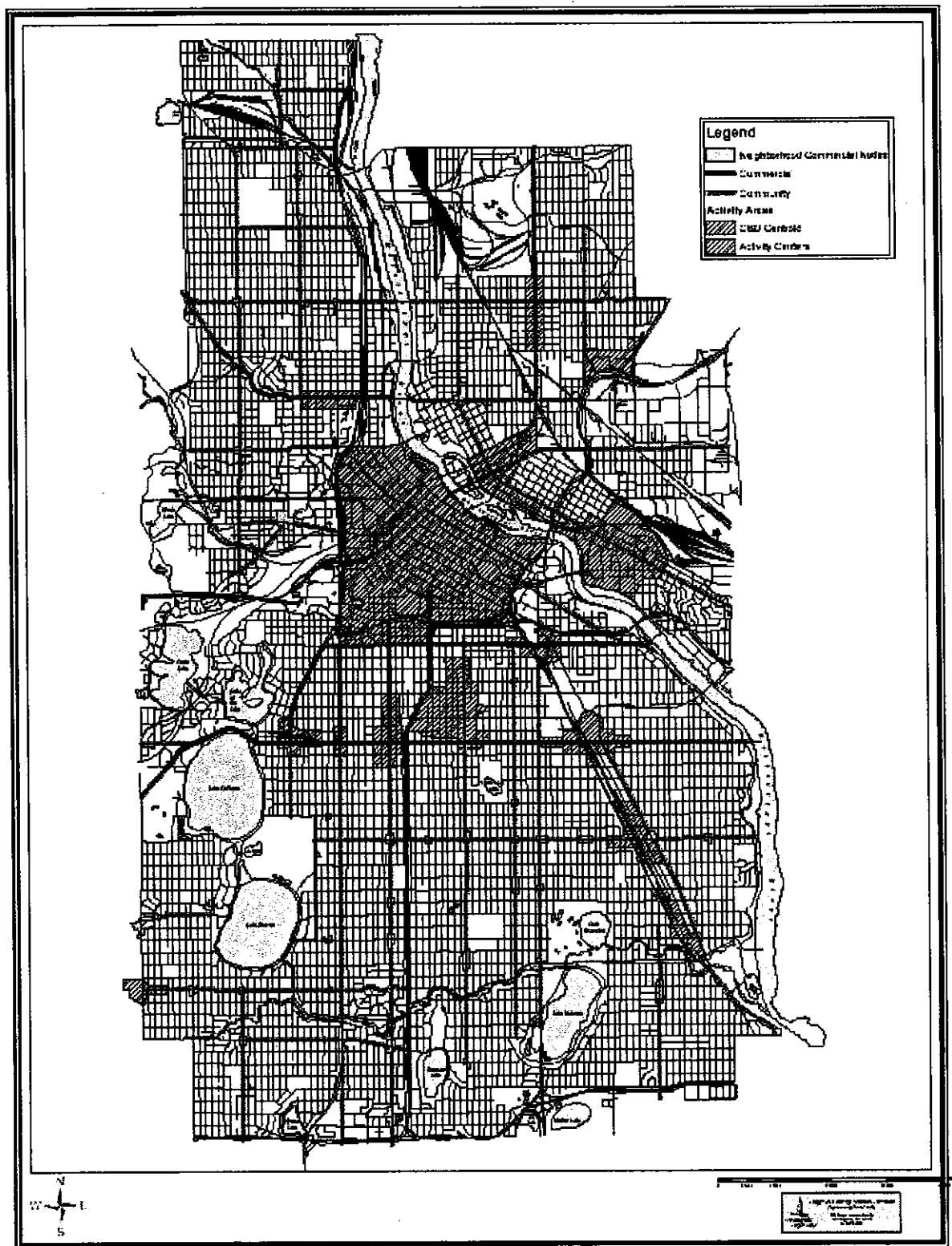
- Outside the CBD Centroid Area but inside the CBD river/freeway ring. This includes portions of Elliot Park, Mills District, Loring Park, and the North Loop neighborhoods.
- A street block that is designated in the Minneapolis Plan as a commercial area AND it has a majority of commercially zoned properties. The Minneapolis Plan cites commercial areas in numerous ways: Commercial Corridors, Growth Centers, and Activity Centers.
- Streets (not designated above in the Minneapolis Plan) that are at least 60% zoned commercial land uses based on the linear front footage and are reasonably contiguous to other pedestrian districts. This includes commercial nodes.
- Primary Transit Network Corridor Stops and TOD/Transit Stations
- High Residential or Employment Density areas
- Around public activity nodes/uses- parks, schools, community centers, etc.
- Bicycle Routes

Residential Lighting Area

- All areas not defined above are residential areas.
- Industrial areas are expected to fall in this area unless classified as a pedestrian area.

Public Works is preparing a map denoting the three lighting districts. An example map (not completed yet) is attached on the next page.

Example Map of CBD Centroid and Pedestrian Areas



Summary of Lighting Quality (Visibility) Standards

Lessons Learned from consultant studies (Orfield and Parsons)

- Subjective differences in levels of glare and amount of light were examined but did not produce significant new information regarding visibility standards.
- There are a variety of fixtures and pole heights that can be combined to meet the visibility standards.
- Use Illuminating Engineering Society (IES) guidelines adopted in RP-8-00 Report that include three key criteria.
- The city's existing alternating high/low lighting system rates well with IES guidelines.

Three Technical Criteria



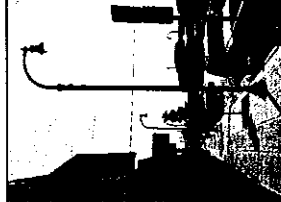
- Foot Candles (amount of light)
- Uniformity (Alternating Brighter and Darker spots)
- Veiling Luminance (Glare)

Combining the Technical Criteria and the System Planning

Criteria/Area	CBD Centroid	Pedestrian Areas	Residential Areas
Foot Candles (amount of light)	1.5 to 2.0 fc	0.8 to 1.2 fc	0.3 to 0.6 fc
Uniformity (Alternating Brighter and Darker spots)	3 to 1 max	3 to 1 max	6 to 1 max
Veiling Luminance (Glare)	0.3 to 1 max	0.3 to 1 max	0.4 to 1 max


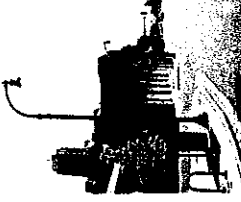

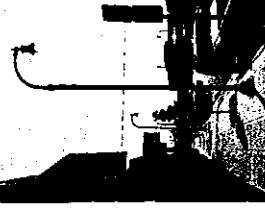
The following three tables list options that best match the above criteria for each lighting area. The "Technical Criteria Met" addresses how well the lighting system meets the criterion mentioned above. The "Comparison to Existing" is what kind of improvement is expected over the existing system.

CBD Centroid Area


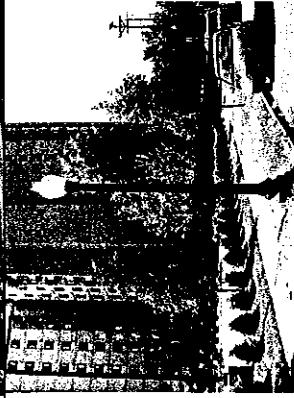

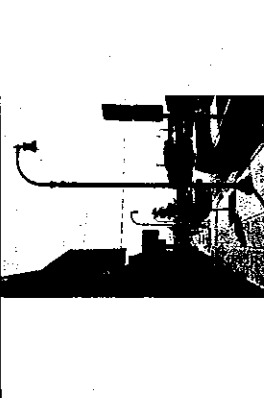
Type of System	Photo & Location	Fixture Type	Technical Criteria Met & Comparison to Existing	Typical Block Layout (Lights per block both sides)	30 Year Annualized Cost per typical block in 2007 dollars
Existing 30 foot High level	 Downtown	Non-Cut Off Shoebox	2 of 3 Significantly exceeds the amount of light	8 lights	\$3,000
Proposed High/low mix (30'//12')		Cut off Shoebox and acorn/lantern mix	2 of 3 Better veiling luminance- less glare	4 high and 4 low	\$3,000 for new (possible retrofit with existing 8 lights would reduce costs)
Proposed 20 foot pendant		Cut-off pendant	2 of 3 Better veiling luminance=less glare	8 lights	\$2,800 for new (possible retrofit with existing 8 lights would reduce costs)

Shaded is Public Works recommendation

Pedestrian Areas

Type of System	Photo & Location	Fixture Type	Technical Criteria Met & Comparison to Existing	Typical Block Layout (Lights per block both sides)	30 Year Annualized Cost per typical block in 2007 dollars
Existing High/low mix (30'//12')	 W Broadway / Central Ave NE / 48 th & Chicago	Semi cut off Shoebox and acorn/lantern mix	2 of 3 slightly exceeds lighting level	7 high and 7 low	\$5,000
Existing 20 foot Pendant	 new Lake Street	Cut-off Pendant	3 of 3 (Lake St significantly exceeds lighting level but was designed that way)	14 pendants	\$5,000
Proposed High/low mix (30'//12')		Cut off Shoebox and revised Semi-cut-off acorn/lantern mix	2 of 3 Less light, improved veiling luminance	6 high and 6 low	\$4,600
Proposed 20 foot Pendant		Cut-off pendant	3 of 3	8 lights	\$2,800

Residential Areas

Type of System	Photo & Location	Fixture Type	Technical Criteria Met & Comparison to Existing	Typical Block Layout (Lights per block both sides)	30 Year Annualized Cost per typical block in 2007 dollars
Existing Wood Poles		Cobra head	1 of 3 no uniformity	3 lights	\$400 mostly O&M only
Existing 12 foot Low Level		Semi-cut off Lantern/ Acorn	2 of 3	6 lights	\$1,900 includes O&M plus capital
Proposed 15 foot Mid-Level		Revised Semi-cut off Lantern/ Acorn	2 of 3 Better uniformity and veiling luminance	6 lights	\$2,100
Proposed 20 foot Pendant		Cut off Pendant	2 of 3 Exceeds light level, less uniformity, better veiling luminance	5 lights	\$1,800

Shaded is Public Works recommendation